

fresh particles of air are continually entering the field with new collisions and starting new waves of sound while the older particles and their waves fall away.

By these extremely rapid actions and in an exceptionally perfect elastic fluid a steady relation or steady disposition of the lines or lanes of air flow and blast pressure must really be established and maintained in evenly persistent shapes and contours within the swirl of incandescent air which forms the meteor's head.

As every meteorite shows a thin surface layer of its own material to have been heated, burned, pushed, scraped, or dragged off as by the flow of some blast of hot air, we must add this small mass of meteoritic dust, this heated, incandescent, vaporized, and burning solid, to the incandescent gas that constitutes the meteor trail. This incandescent dust is a new chemical compound of meteoritic matter and atmospheric gases and is left behind as a long, comparatively straight, luminous streak. Observers have watched such streaks for many minutes, and the changes in their apparent shapes do not seem to us to require any assumption of electric or magnetic action for their explanation. A long streak of isolated particles of iron rust does not constitute a magnet, nor could it show any magnetic phenomena under magnetic influence, excepting such as are revealed by individual positively and negatively electrified ions in a perfect vacuum, such as have been revealed to us by the well-known studies of J. J. Thomson. That the streaks do not show such phenomena demonstrates the absence or feebleness of the magnetic and electric fluids in the upper atmosphere of our earth.

It seems to the Editor that the noises that emanate from the meteors are still as difficult of explanation as ever. Professor Herschel's exposition brings vividly before us the waves of sound that are being interchanged between the mass of the meteor and that of the compressed air in its neighborhood, but how can these sound waves reach the ear of an observer through the rarefied atmosphere that exists at a very short distance from the meteor. This atmosphere is so thin or so rare that not only are ordinary sound waves not observable through it, but, according to our present theory of sound, could not even exist therein. Meteors that are 50 miles above the earth's surface and moving nearly horizontally give out sounds that are heard like the discharge of a nearby cannon, although the observer is 150 miles away. This has been notably the case with several that have been investigated in the United States. At these great elevations the gaseous pressure of the atmosphere, that is to say, the elastic pressure which follows the law of Boyle and Mariotte, no longer exists. The individual particles are so far apart that, according to the kinetic theory of gases, the collisions among the particles are infrequent. A meteor rushing among these at the usual meteoric rate of 20 miles per second strikes the individual particles and drives them forward far more frequently than they strike each other; they would, in fact, be entirely submissive to its influence, and, after escaping therefrom, they would find no surrounding atmosphere capable of transmitting sound waves downward to the denser atmosphere near the earth's surface. The sound waves observed in connection with meteors are always described as resembling the booming of an irregular discharge of artillery, rumbling like thunder, coming first from a point on the track of the meteor nearly opposite to the observer, but then from points successively farther back on the preceding parts of the track. It is never heard from points on the subsequent parts of the track. The physical explanation of this phenomenon has been attempted by many, but we know of nothing sufficiently satisfactory to be worth repeating. The rolling of thunder takes place in an analogous manner, but that relates to the lower, denser atmosphere. In our report on the meteor of December 24, 1873, we showed that, if the whole meteor track nearest and opposite the observer

be considered as a straight line every point of which became instantaneously the source of sound, then the observer should hear first a crash and subsequently the roaring noises from the more distant preceding and succeeding portions of the line. But why should it always roll backward, and how can any sound at all pass from the thin upper air down to the earth? It does not do to say with Professor Mach and others that every stroke of the meteor against an atom of air is a collision and that a myriad such strokes will make a noise, for this only explains the vibrations within the mass of the meteor and within the volume of compressed air attending it; it does not explain the passage of such sounds to the observer through the "Crookes vacuum" of the upper air.

#### METEOROLOGICAL LITERATURE IN THE PUBLIC LIBRARIES.

In connection with a lecture on "Storms," delivered by Mr. John R. Weeks, official in charge of the local office of the Weather Bureau at Binghamton, N. Y., a local newspaper, the Press Leader, published a list of the books on meteorology procurable at the Public Library, in order that those who wished to prepare for the lecture, and those with a desire to go further into the subject, might be guided to the proper sources of information.

This practice is commended to other Weather Bureau lecturers as being a means of increasing the interest of the public in the subject of meteorology. It will also stimulate the librarians to provide the necessary books when called for.

The Librarian of the Weather Bureau has compiled and published a list of books for use in studying meteorology, which will no doubt prove valuable to Weather Bureau officials and others who are called upon to select or advise in the selection of authoritative books on meteorology.—*E. R. M.*

#### STANDARD TIME AT KEY WEST.

On November 16, 1905, the board of aldermen of the city of Key West, Fla., decided to change the standard of time in local use from ninetieth meridian time to seventy-fifth meridian time, the change to be effected by omitting the hour between 11 a. m. and noon on Thursday, November 23, 1905. This action was taken "in order that the time on the city clocks might be the same as that of the naval station, the telegraph office, and the ships calling there."

In order to comply with the provision of Weather Bureau Instructions No. 210, of 1904, dated December 16, 1904, which requires that "all instrumental records and the daily local record shall be kept on local standard time," it has been directed that seventy-fifth meridian time be used as station time at the local office of the Weather Bureau at Key West, Fla., beginning immediately after 12 midnight of December 31, 1905.

Those who have occasion to consult the original records above mentioned should bear in mind that they have been prepared on ninetieth meridian time during the year 1905.

#### INFLUENCE OF LOCATION ON THE WINDS.

An article on the influence of orography on the winds at Quebec, by Monsignor J. C. K. Laflamme, professor of geology, etc., at Laval University in that city, brings out strongly the fact that the winds recorded at this meteorological station are controlled almost entirely by the configuration of the neighboring ground, and this too, to an extent that would hardly have been expected, notwithstanding the fact that the broad valley of the St. Lawrence has a general trend that coincides with the prevailing general movement of the atmosphere. The memoir is published in tome 10, of the second series of the *Memoires de la Société Royale du Canada*.